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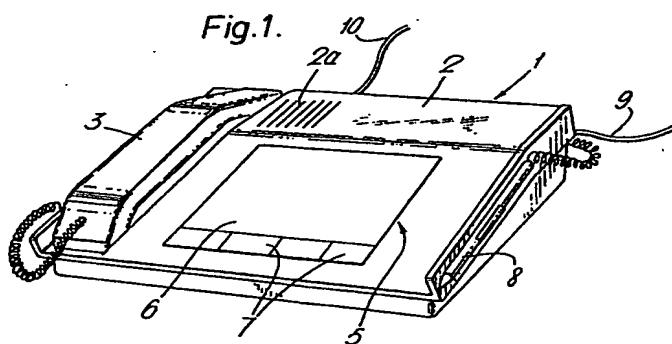
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International Standard Electric Corporation (USA-Delaware)
320 Park Avenue, New York 10022, State of New York,
United States of America(72) Inventor
Manfred Laube(74) Agent and/or Address for Service
P. G. Ruffhead, ITT Patent Department UK, Maldstone Road,
Foots Cray, Sidcup DA14 5HT

(54) Communication terminal

(57) A compact communication terminal (1) for simultaneously transmitting voice and graphical representations, comprises an input device (5) consisting of a flat display screen (6) with a transparent electrically conductive support (writing pad), a pushbutton telephone set without an associated dial keypad, and a control circuit. The input is effected by touching the electrically conductive support. Upon lifting the handset (3) of the telephone set, the terminal is automatically set to a first mode "telephone operation" in which the dial keypad is represented on the display screen (6). A call number is dialled by touching the corresponding keypad fields. The establishment of the connection is indicated by the disappearance of the keypad display. Along the lower longitudinal edge of the input device, switching fields (7) are marked within the area of which functions are represented which are capable of being selected by touch. In the first mode of operation all of the remaining modes are represented.



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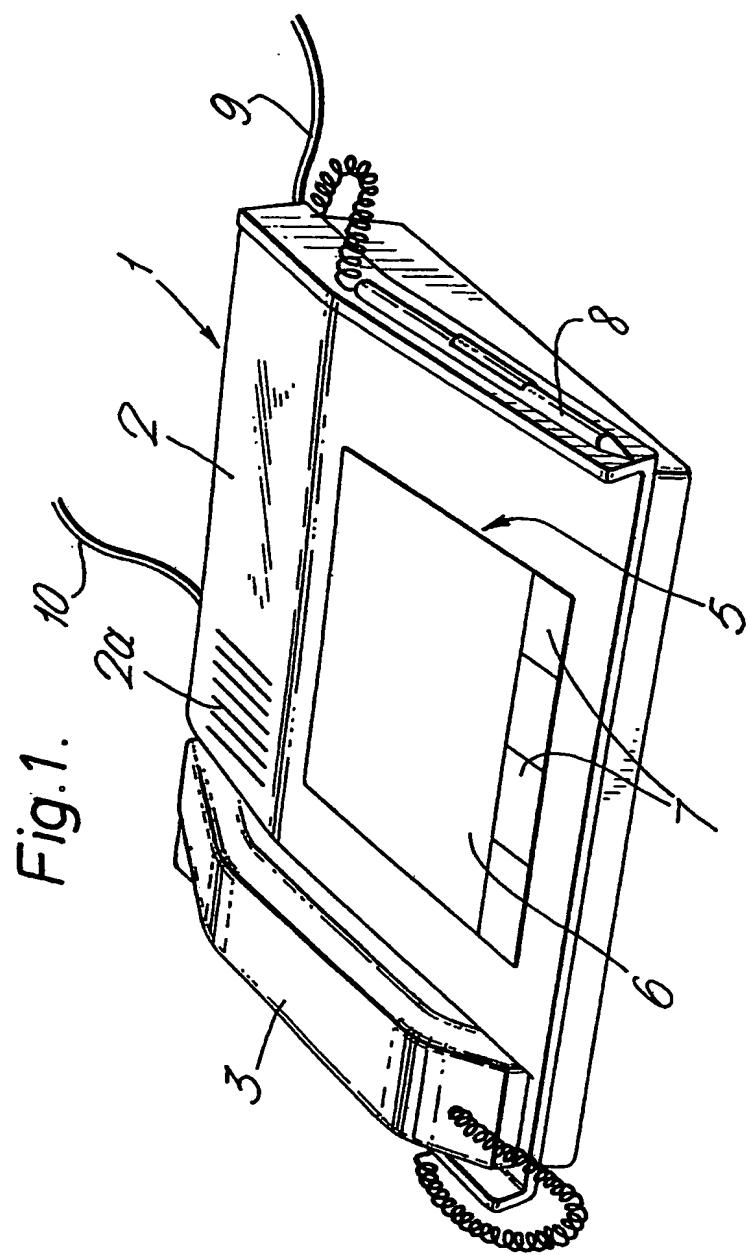
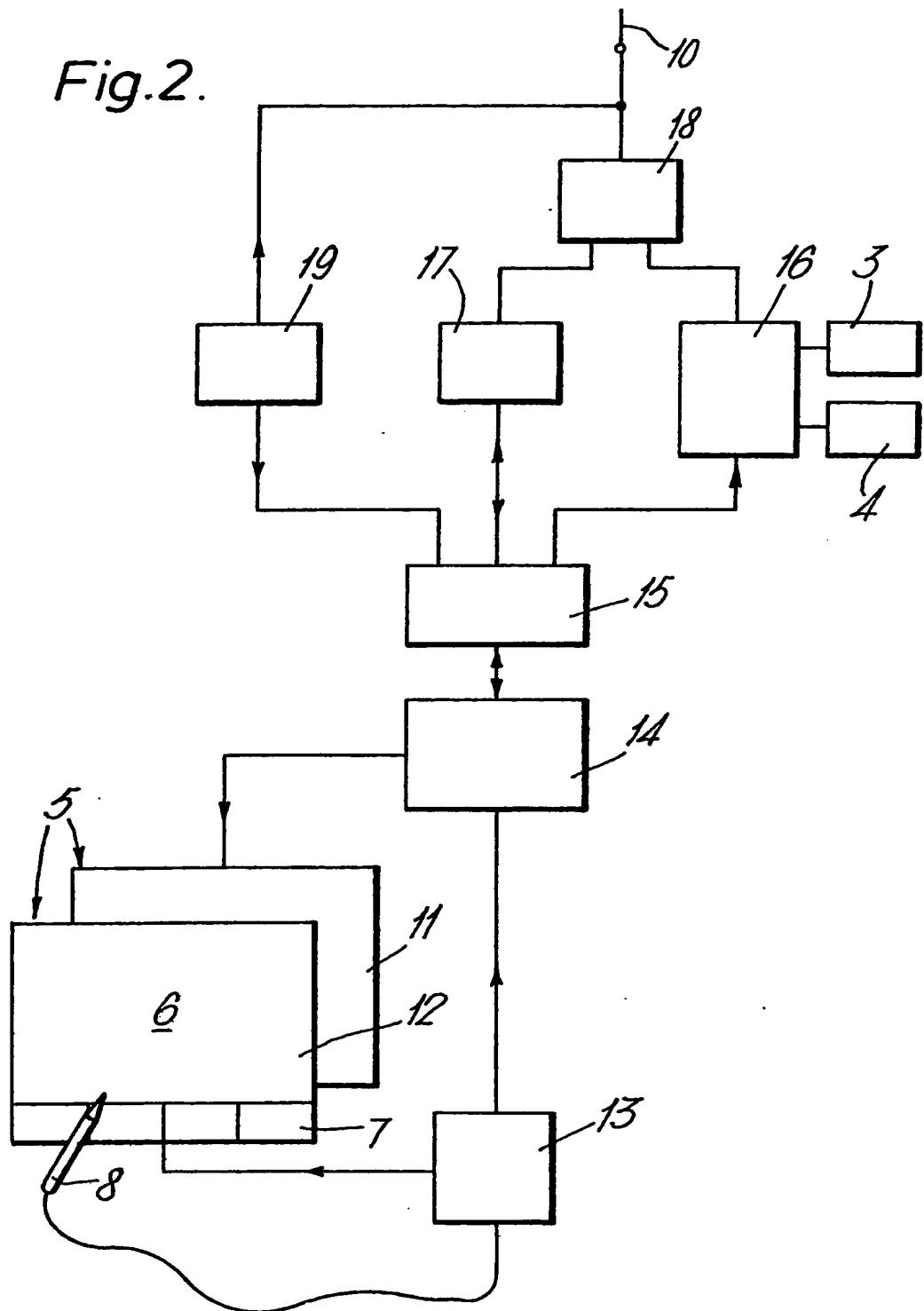


Fig.2.



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Fig.3.

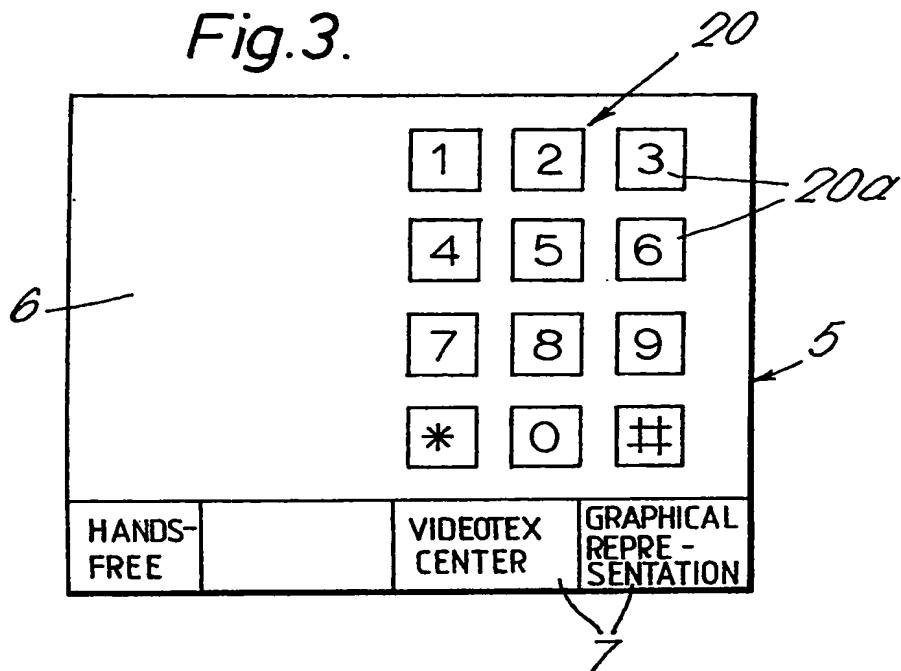
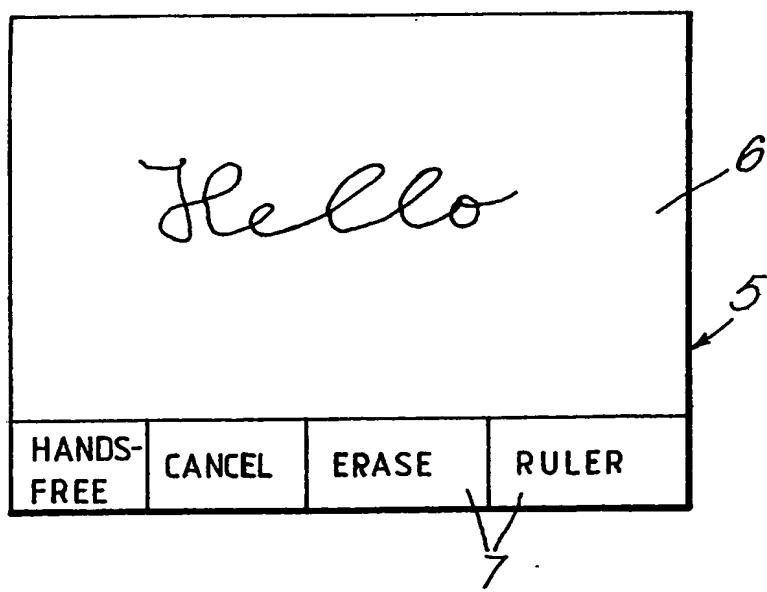


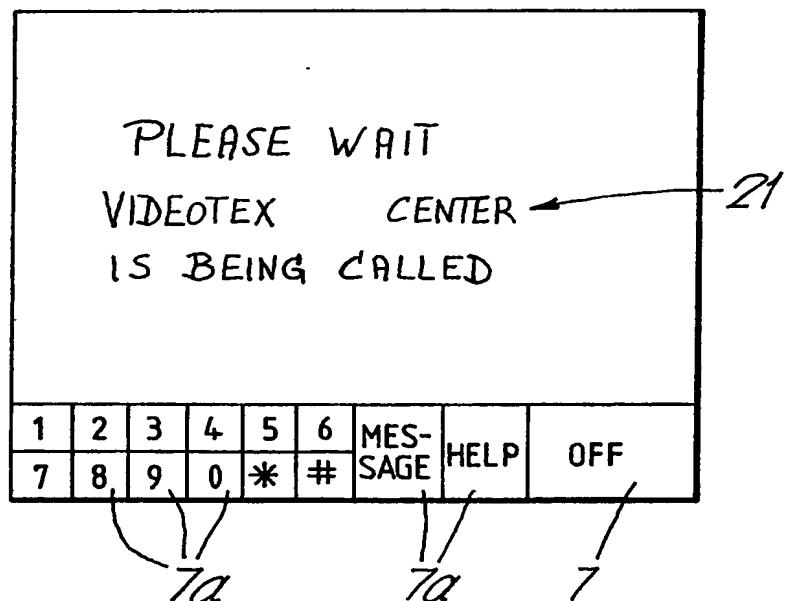
Fig.4.



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Fig.5.



SPECIFICATION**Communication terminal**

5 This invention relates to a communication terminal for representing and transmitting graphical information, of the kind comprising a display screen having a transparent support via which the input of the graphical information is effected by way of touch.

10 Such a terminal is known from DE-OS 24 33 667. This known terminal in which a cathode-ray storage tube is used as the display screen, is intended as an attachment to an existing telephone installation, with a second telephone channel being provided for

15 transmitting the graphical representations.

For some time, work stations have been known which are equipped for transmitting voice and graphical information via the same line. One such terminal is described in "The Electrical Communication Laboratories, NTT, Technical Publication", No.282, of June 1983. This terminal comprises a telephone set for establishing the connections and for voice communication, as well as an input unit for the graphical presentation, and a visual display unit.

20 Both of the aforementioned terminals have separate units for voice transmission and the transmission of graphical information. This involves a high technical investment with a corresponding space requirement, each unit having to be operated individually.

25 It is an object of the invention, therefore, to provide a single communication terminal which combines all the necessary functions.

According to the invention in its broadest aspect, a communication terminal of the kind referred to is

30 characterised in that it comprises a flat display screen and is constructionally combined with a pushbutton dialling telephone comprising a handset, that it is controlled in such a way that upon lifting the handset the dial keypad is represented on the display screen,

35 the input of call numbers being enabled by touching the support within the range of representation, that upon establishment of the connection, the representation of the dial keypad is terminated, and that thereafter the input for the graphical information,

40 together with the release of the voice communication, is either effective or capable of being connected later.

The advantages which are achieved by the invention reside above all in that there is provided a flat display screen which, moreover, is intended for

45 multiple utilisation, thus resulting in a compact terminal. Also, the terminal is very much user-optimised, because the user is capable of concentrating on the display screen.

An embodiment of the invention will now be

50 described by way of example with reference to the accompanying drawings, in which:-

Figure 1 shows a communication terminal according to the invention in a perspective representation,

55 Figure 2 shows the block diagram of the control circuit of the terminal as shown in Figure 1,

60 Figure 3 shows the input device according to Figure 1 in a first mode of operation,

65 Figure 4 shows the input device according to Figure 1 in a second mode of operation, and

70 Figure 5 shows an input device according to Figure 1

in a third mode of operation.

Figure 1 shows in a perspective representation a compact communication terminal 1 which is a constructional combination of a pushbutton dialling telephone with a handset 3 and a device for displaying and transmitting graphical information via an input device 5.

The terminal 1 is housed in a casing 2 which is designed to have a flat slope in the forward direction toward the operating side. On the left-hand side there is a receiver rest with a hook switch for the handset 3. In the rear part of the surface of the casing 2, slots 2a are provided below which are positioned the microphone and the loudspeaker of a hands-free facility 4 (Figure 2). The latter can be switched on separately. An input device 5 is let into the slanting surface of the casing 2. This input device 5 consists of a flat display screen 11 (Figure 2), for example, a liquid crystal display which, on its outside, is provided with a transparent, electrically-conductive, homogeneous resistive coating 12 (layer) (Figure 2). This resistive coating 12 may be either detachably or inseparably connected to the display screen 11. Along the lower longitudinal edge of the input device 5 and below the resistive coating 12, four switching fields 7 are marked on the display screen 11. These fields 7 are reserved for the input of switching functions, whereas the remaining area 6 of the input device 5 chiefly serves for the graphical representation.

For initiating switching functions and for the input of graphical information there is provided a pen (stylus) 8 by which, upon touching the resistive coating 12, the coordinates of the respective point of contact are tapped in the form of voltage values and fed to a processor-assisted processing unit for evaluation. The latter causes the performance of the selected switching function and the representation of the graphic input on the display screen 11, as well as the transmission via a subscriber line 10 to a connected communication terminal at a distant location. For the power supply of the processing unit, the terminal 1 is provided with a power connection 9.

Figure 2 shows the block diagram of the control circuit of the terminal 1 with a schematic representation of the input device 5. For the sake of better understanding, the resistive coating 12 which is actually congruent with and firmly connected to the display screen 11 is shown in a somewhat staggered representation. As already mentioned, the display screen 11 is a liquid-crystal display whose row and column electrodes are connected to a matrix memory which forms part of the processor-assisted processing unit 14. The resistive coating 12 is provided along its edges with electrodes. Oppositely-arranged electrodes are connected in pairs to a circuit component 13 which, in the energised state of the terminal 1, alternately applies voltage to the pairs of electrodes. This circuit component 13 moreover contains a coder to which the pen 8 is connected via a cable. The transmission of the information between the pen 8 and the coder of the circuit component 13 may also be effected without wires. When the pen 8 is placed on to the resistive coating 12, the pen 8 in the alternating succession of the voltage applied to the electrode pairs of the resistive coating 12 takes off the voltage

130

values which, as coordinate values, define the position of the pen 8 on the resistive coating 12. The voltage values are digitalised in the coder of the circuit component 13 and fed to the processing unit 14.

5 The present embodiment is capable of performing several modes of operation: telephone operation with the possibility of switching over to hands-free operation, telephone operation or hands-free operation together with the representation and transmission of graphic information. For selecting the respective mode of operation there is provided an operating mode selection switch 15 which is housed inside the terminal 1. As can be seen from Figure 2, a pushbutton telephone set without a dial unit, consisting of a 10 telephone adapter 16 which serves to interrupt the internal speech path during the dialling process, is connected to the selection switch 15, as well as the handset 3 and a hands-free device 4, a coder/decoder 17 for editing the graphical data, and a videotex 15 modern 19. While the latter is connected directly to the subscriber line 10, the telephone adapter 16 and the coder/decoder 17 are connected to the subscriber line 10 via a frequency multiplexer 18.

In the mode of operation "representation and 20 transmission of graphical information", the telephone set 16/3/4 and the coder/decoder 17 are connected directly to the processing unit 14. Relative thereto, the connection of the coder/decoder 17 can be effected, after the connection has been established, via the 25 telephone set to the called subscriber either automatically by the processing unit 14 or else by the input of an instruction with the aid of the pen 8 on a switching area represented on the display screen 11. The voltage values which are taken off in the course of this via the 30 resistive coating 12, are recognised via the processing unit 14 as switching criteria. In the following description, this will be explained in greater detail with reference to Figures 3 to 5 in connection with the block diagram as shown in Figure 2.

35 As already mentioned hereinbefore, the pushbutton telephone set has no dialling unit. This function is taken over by the processing unit 14 and by the display screen 11. For this purpose, the image of a dialling keypad 20 is stored in a read-only-memory of the 40 processing unit 14.

Figure 3 shows the input device 5 of the terminal 1 in the "telephone" mode of operation. Upon lifting the handset, the processing unit 14 is caused to effect the input of the image of the dial keypad 20 into the matrix 45 memory of the display screen 11, which is thus represented on the display screen 11 within the area 6 of the resistive coating 12. At the same time, within the switching fields 7 as marked on the resistive coating 12, statements concerning the further modes of 50 operation are displayed which are likewise taken from the read-only memory. A program turned on in this mode causes the coordinate values of the resistive coating 12 lying within the displayed keypad fields 20a and the marked switching fields 7, to be associated 55 with the respective numerical value or the stated function, respectively. Accordingly, calling of a subscriber is effected by touching the resistive coating 12 with the pen 8 within the area of the keypad fields 20a in the succession of the number to be called. The 60 processing unit 14 converts the coordinate values into 65 corresponding trains of pulses which, via the selection switch 15 which is in its normal position, extend to the telephone adapter 16, and from there via the frequency multiplexer 18, to the subscriber line 10. Upon 70 lifting the handset 3, the multiplexer 18 is ready to operate. When the desired connection has been established, this is visually indicated in that the representation of the dial keypad 20 on the screen is erased.

75 If, upon establishment of the connection between two or more subscribers, for example, in the case of a conference circuit, there is to be effected a transmission of graphical information, each of the subscribers must switch his individual terminal 1 to the second 80 mode of operation "graphical representation". This is effected in a simple way by touching the resistive coating 12 with the pen 8 within the area of the switching field 7 marked accordingly on the display screen 11. owing to the program-sensitive assignment 85 of all coordinate values lying within the area of the respective switching field 7, to the represented function, there is effected by the processing unit 14, via the switch 15, the switching over to the graphical operation, in the course of which, however, the voice 90 communication is maintained.

From any optional time position onwards, following the establishment of the connection, the hands-free facility 4 can be turned on or off in the same way by touching the resistive coating 12 with the pen 8 within 95 the area of the correspondingly marked switching field 7.

After having switched over to the second mode "graphical representation", there are changed according to Figure 4, also the function statements in the 100 switching fields 7. With the exception of the remaining optional hands-free operation, functions are now associated with the switching fields 7 which serve to facilitate the graphical communication. In this mode of operation, the connection to the telephone set for 105 the optional on/off switching of the hands-free device 4 is maintained, and the coder/decoder 17 is connected to the processing unit 14.

As already described hereinbefore, the movement of the pen 8 within the area 6 of the resistive coating 12 110 is represented in an image-dotwise manner on the display screen 11.

For this purpose, the obtained coordinate values are continuously evaluated by the processing unit 14 and fed to the matrix memory. At the same time, data as 115 fed to the matrix memory, are also supplied to the coder/decoder 17. The latter, apart from a modem function, has the function of effecting the redundancy reduction for reducing the transmission bandwidth. Via the frequency multiplexer 18 there is effected the 120 simultaneous transmission of voice and redundancy-reduced graphical data, with the latter, in known manner, being transmitted via a narrow bandpass range within the bandwidth of the telephone channel.

At the receiving end, in the reversed order of 125 sequence and by the coder/decoder 17, there is effected a recovery of the graphical data which, via the processing unit 14, is fed to the matrix memory. Accordingly, on the display screen 11 of the one or 130 more corresponding terminals 1, there is reproduced the graphical representation as produced on the

transmitting terminal 1. Via the transparent resistive coating 12, each of the subscribers is now able to make amendments and, upon touching one of the switching fields 7 with the pen 8, to make corrections. Since, 5 always, only one station at a time can transmit, the placing of the pen 8 on to the resistive coating 12 at one terminal 1, ensures that the graphic input is inactivated at the other corresponding terminals.

By replacing the handset 3, the connection to the 10 one or more subscribers is disconnected, and the represented functions and settings are erased. In response to a new lifting of the handset 3, the first mode of operation as optically shown in Figure 3, is automatically reassumed. In starting out from this 15 setting it is then possible to change over to one of the modes of operation as shown in the switching fields 7.

The present embodiment also provides for the 20 display of videotex information. By touching the switching field 7 marked "videotex centre" with the pen 8, the processing unit 14, via the operating mode selection switch 15, establishes a connection to the videotex modem 19. At the same time, the programme is changed over, with the result that the former contents of the matrix memory are erased and the 25 statements as shown in Figure 5 are stored and represented via the display screen 11. After that, the videotex centre is automatically dialled by the processing unit 14. The screen-display notice 21 indicates to the user optically the process that has been initiated, 30 this representation being cancelled upon establishment of the connection.

As can be seen from Figure 5, the switching fields 7 in this mode of operation are partly subdivided several times (partial fields 7a). This subdivision is effected by 35 a representation of the corresponding lines on the display screen 11. Also in this case, via the turned-on program, by touching the resistive coating 12 with the pen 8 within the area of the individual fields 7 and partial fields 7a, the represented switching functions 40 are triggered, so that a communication can be taken up with the videotex centre. Touching the switching field 7 "off" with the pen 8 leads to the transmission of an interrupt signal, by which the existing connection is interrupted. This criterion simultaneously leads to the 45 switchover of the terminal 1 to the first mode of operation which, to the user, is recognisable by the optical display as shown in Figure 3.

In the embodiment as described hereinbefore, the call up of the voltage values for forming the coordinate 50 values, is effected via a pen 8. In cases where the coordinate-value input is to be effected by finger touch or via an electrically-neutral article, a transparent foil is preferably disposed at a small spacing from the resistive coating 12, which is electrically conductively 55 coated on its inside. This coating, according to the pen 8, is connected to the circuit component 13. A contact between the foil and the resistive coating effects the picking off of the voltage values marking the point of touch, which are then further processed by the circuit 60 component 13 in the way as already described.

CLAIMS

1. Communication terminal for representing and transmitting graphical information, of the kind comprising a display screen having a transparent support 65 via which the input of the graphical information is

effected by way of touch, characterised in that it comprises a flat display screen (11) and is constructionally combined with a pushbutton dialling telephone comprising a handset (3), that it is controlled in

70 such a way that upon lifting the handset (3) the dial keypad (20) is represented on the display screen, the input of call numbers being enabled by touching the support (12) within the range of representation, and that upon establishment of the connection, the 75 representation of the dial keypad (20) is terminated, that thereafter the input for the graphical information, together with the release of the voice communication, is either effective or capable of being connected later.

2. A terminal as claimed in claim 1, characterised 80 in that for connecting the graphic input, a switching range is represented on the display screen (11).

3. A terminal as claimed in claim 1, characterised in that the support (12) is subdivided into a first and a second part, that the first part (6) serves to represent 85 the graph, that the second part is additionally subdivided into switching fields (7), and that on the display screen (11), within the area of the individual fields (7), functions are represented which are capable of being selected by touching the support (12).

90 4. A terminal as claimed in claim 1, characterised in that the support consists of a transparent, electrical-conductive, homogenous resistive layer (12).

5. A terminal as claimed in claim 4, characterised 95 in that the resistive layer (12) is detachably connected to the display screen (11).

6. A terminal as claimed in claim 4, characterised in that the resistive layer (12) is inseparably connected to the display screen (11).

7. A terminal as claimed in claim 4, characterised 100 in that an electric pen (8) is provided which, for effecting the input of information, is to be brought into contact with the resistive layer (12), and which is electrically connected to the circuit of the terminal (1).

8. A terminal as claimed in claim 7, characterised 105 in that the connection between the pen (8) and the terminal (1) is established via an electric line.

9. A terminal as claimed in claim 7, characterised in that the connection between the pen (8) and the terminal (1) is established without wires.

110 10. Communication terminal as described with reference to the accompanying drawings.